RADIOGRAPHY

as an Aid to Diagnosis,

illustrated by a series of 82 skiagrams.

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The discovery of the action of X-Rays raised hopes of their acquisition to Surgery and Medicine which have not been disappointed. As time advances improved appliances are being constantly evolved which promise later on to enhance their value considerably. As yet the art of Radiography is in its infancy and in the future much greater accuracy is confidently to be looked for. But even now, its help in numberless cases, both Surgical and Medical, cannot be overestimated. The Radiographer has many difficulties to contend with. The least oversight is sure to lead to disappointment and with all possible care on his own part the result may be a failure owing to the variability of tubes or faulty plates. Results also vary with the exposure or the over or under development of plates. These difficulties are not so disastrous when taking skiagrams of the extremities, but when regions of the thorax and abdomen and the cranial cavity have to be considered, great skill, combined with knowledge of his tubes, is essential on the part of the operator in order to get satisfactory results. Experience in placing the patient in the most favourable position for the object desired is also important. When all requisite details are mastered

and the operator has reliable tubes, good plates, suitable couches and compressors, the results are now very satisfactory. Besides what can be done with skiagrams, X-Rays by means of Screen examinations are of great value and importance.

With wider experience in technique has come increased knowledge of what is necessary for the protection of the operator. In the past there have been unfortunately instances where the operator, through lack of proper precautions and inexperience of the injurious effects of the Rays, has suffered seriously and beyond possible recovery. Now however the tubes can be so covered in by protective casing that only carelessness on the part of the operator can expose him to any serious risk.

UPPER EXTREMITY.

Beginning with the upper extremity the skiagrams here shown illustrate injuries difficult to diagnose accurately by the usual physical examination. Gross fractures to the trained touch are easily diagnosed but when the displacement is slight and the parts swollen and tender it is a great advantage to the Surgeon and especially to the patient that the exact nature of the injury should be grasped with as little manipulation as possible. Such an injury is seen in the transverse fracture of the first phalanx of the index finger which is shown in the first illustration.

Fig. 1.

This fracture as there was no displacement was overlooked. As the finger continued to be painful after some time had elapsed it was sent to be radiographed and the fracture discovered.

A more severe injury is that here shown of a comminuted fracture of the base of the metacarpal bone of the thumb.

Fig. 2.

The exact nature of the injury could only with difficulty be inferred from digital examination owing to swelling and the thickness of the muscles on the palmar aspect.

In an injury of the wrist such as is shown in figure 3, we have a condition which only a skiagram can fully reveal. The styloid process of the ulna is the injured part. This is broken off in more than one fragment and a portion is pulled forward amongst the soft tissues until quite a gap separates it from the bone to which it belongs.

Fig. 3.

Of very distinct advantage is the possibility of demonstrating as is here done (Figure 4.) the result of wiring an intractable fracture. The Surgeon might feel satisfied from the feel and appearance of the parts that the result was a success but one feels much more assured when the parts can be shown in a photograph as can be now so readily done.

Fig. 4.

Figure 5, that of injury to the elbow, shows a transverse fracture of the olecranon which gave rise to very slight displacement. The diagnosis of the condition was greatly aided by this skiagram.

Fig. 5.

Exceedingly interesting and helpful results can also be shown from radiography of injuries near and at the shoulder joint.

The next illustration, (Figure 6.) shows a fracture through the Surgical neck of the humerus.

Fig. 6.

The adjoined illustrates a fracture through the anatomical neck of the humerus passing obliquely downward to the level of the surgical neck on the inner aspect.

Fig. 7.

Fig. 8.

A much more severe injury is shown in skiagram 8. Here we see a fracture through the surgical neck of the humerus, an oblique fracture through the tuberosity extending from the anatomical to the surgical neck externally, and a dislocation of the head of the bone downwards and inwards below the glenoid articular surface.

Not less interesting and instructive is the accompanying skiagram (9), which demonstrates a fracture of the glenoid cavity of the scapula where we have the lower portion of the articular surface broken off and displaced downwards.

Fig. 9.

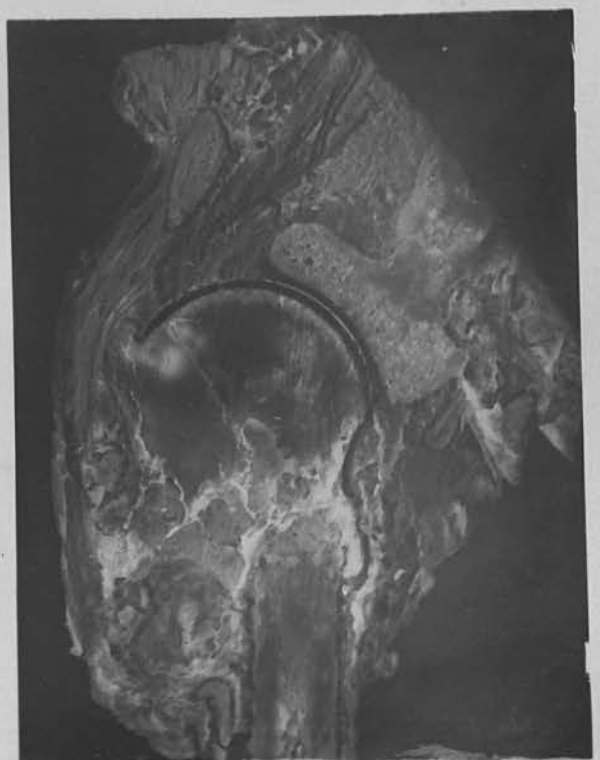
Fig. 10.

The next illustration (10) shows a fracture thro' the surgical neck of the humerus associated with an oblique fracture of the scapula which begins below the glenoid cavity and extends upwards and inwards.

Not only in cases of injuries do we get assistance from this new aid to surgery. The patient from whom the next radiogram (11) was taken sought advice for a painful swelling over the head of the humerus. There was no history of injury. The skiagram showed the bone to be extensively invaded by a new growth, which had destroyed a considerable portion of the bone in the region of the surgical neck and was invading the head of the bone. A diagnosis of sarcoma was confirmed by the radiograph. The limb was amputated and a portion of the scapula removed clear of the diseased area. The operation was successful and the patient is doing well. A longitudinal section through the diseased bone is shown in the accompanying photograph (12). The malignant nature of the growth was further confirmed by a microscopical examination.

Fig. 11.

Fig, 12.



LOWER EXTREMITIES.

The first illustration from the lower limb shows a difficult case, where owing to the close position of the neighbouring bones, the exact nature of the injury cannot be determined by manual examination.

Fig. 13.

The picture shows a severe fracture of the proximal end of the metatarsal bone of the 3rd: toe.

The ankle joint has often given unsatisfactory results after injury. This illustration (14) shows a fracture of the astragalus from two points of view. Guided by the skiagram the surgeon decided that the best treatment here was to remove the fractured bone. This was done with very satisfactory results.

Fig. 14.

15.

The next skiagram (15) shows a fracture involving the lower ends of the tibia and fibula involving their articular surfaces, as well as a dislocation backwards of the foot.

16.

The following skiagram (16), illustrates a fracture of the tibia which was missed after careful examination by a surgeon. There is no displacement, and owing to the long obliquity combined with the support of the fibula no movement or crepitation could be elicited.

The next two prints, 17 and 18, show severe fractures of both fibula and tibia, the exact nature of which could only be discovered, without great pain to the patient, by the aid of skiagrams.

18.

In the following, Fig. 19, is seen a complicated fracture below the knee. The result after careful treatment was disappointing, and it was then suspected that the injury had been followed by sarcoma of the bone.

The radiogram showed the unsatisfactory result was due to the complicated nature of the fracture involving both tibia and fibula so near the joint.

Fig. 19.

Figs. 20 & 21.

The patella has often been a source of difficulty in diagnosis and treatment.

The two cases, 20 and 21, shown here, demonstrate, the one an unsuccessful result of wiring the two portions of the fractured bone, and the other, a fracture of the lower corner which could not be diagnosed by manipulation.

This picture of the lower end of the femur, shows the result of treatment with wiring of the fragments, which have again got displaced.

23.

The three following skiagrams are interesting as showing two fractures in one femur. The case was sent for radiography with a diagnosis of the upper fracture which is shown in the illustration opposite. (23)

24.

A second negative was taken, showing the lower fracture which was not previously suspected.

25.

The third (25) shows both fractures although the upper one is not quite sufficiently on the plate.

When we come to injuries at the hip, accuracy of diagnosis becomes extremely difficult and important. With a certainty as to the condition and nature of the injury the manner of treatment is put on a sure basis.

The next shows a fracture through the great trochanter of the femur.

Fig. 26.

27.

The two following, 27 and 28, illustrate intracapsular fractures.

The first one shows impaction of the neck of the bone into the great trochanter.

28.

The second shows the neck driven into the head of the bone.

29.

This skiagram shows an interesting condition - the congenital absence of the fibula in a child. There is besides, faulty development of the bones of the foot.

The next, fig. 30, shows a case of congenital dislocation of the hip with only a trace of the acetabulum and absence of the head of the femur.

30.

Fig. 31.

This is an interesting print showing a body in the knee joint posteriorly. This was a portion of a synovial fringe which had become ossified, and interfered with the freedom of the joint. It was successfully removed.

In showing early development of disease and indicating timely treatment, X-Rays are a great assistance.

This skiagram where the diseased is contrasted with the healthy knee shows it at a stage when the disease has seriously injured the bone and joint. The swelling has led to the narrowing of the inter-articular space. The outline of the bone is less sharp.

32.

The next shows an abscess in the upper end of the tibia involving the under surface of the epiphysis, but fortunately it has not yet extended to the joint.

33.

34.

In Fig. 34 is seen the result of more advanced though arrested mischief, leading to ankylosis of the joint. This was followed by marked atrophy of the fibula.

The effects of tubercular mischief at the hip are illustrated in the 3 following skiagrams.

35.

In the first, fig. 35, the disease has shown itself in the great trochanter of the femur. There was great swelling and an abscess over the trochanter. It was successfully operated upon and further mischief averted.

Fig. 36.

In the next, 36, the disease has commenced in the head of the bone and acetabulum on its lower aspect, while

Fig. 37.

the third, 37, shows further mischief in the head of the bone and acetabulum, with a tumour of the bone lower down, probably due to tubercular infection.

Fig. 38.

This skiagram demonstrates a case of Sarcoma involving the lower end of the tibia and fibula. It shows clearly rarification of the bone owing to the destruction caused by the new growth. This was removed by operation and the diagnosis verified by section of the bone and microscopical examination.

We may contrast with this the two following radiograms of diseased bone where we have evidence of osteitis and periostitis showing rarified bone in both and multiple abscesses in the second of them (Fig. 40). The abscess

cavities were accurately located by the aid of the skiagrams and drainage carried out at the necessary points.

39.

40.

This skiagram of the coccyx shows some displacement due to a fall. On examination under an anaesthetic the surgeon found dislocation with some rotation. This was replaced with satisfactory results.

(41

THE SKULL AND BRAIN.

What can be done to aid the Surgeon by Radiography of the skull and its contents is of great value and interest. This figure shows what can be demonstrated in the normal skull. We clearly see the sutures and grooves for blood vessels on the inner surface of the skull. At the base of the skull, we can trace the tentorium cerebelli, note the air cells in the squamous portion of the temporal bone, the clinoid processes of the Sella turcica with the pituitary body. The relation of these parts to points on the exterior can be clearly noted.

Fig. 42.

If we contrast this with the former skiagram, we find the distinctive parts of the Sella turcica greatly altered. The anterior clinoid is spread out and the posterior obliterated. There is a shadow in this region which extends as far back as the pons and displaces the brain upwards. The skiagram confirmed a clinical diagnosis of tumour pressing upon this important area of the brain. The patient was operated on and the tumour found as predicted but it was too extensive to be removed, and the patient died soon afterwards. Such a skiagram from a case where the tumour density varied very little from that of the brain makes it highly probable that under favourable conditions haemorrhages and other lesions might be demonstrated.

Fig. 43.

Fig. 44.

The next figure, 44, shows a bullet in the occipital region. It was located by taking radiograms from different directions, and this was done so successfully that the surgeon was able to trephine over the exact spot where the foreign body was, and remove it. The markings over the brain are due to faulty development of the negative.

Fig. 45.

This skiagram, 45, shows a foreign body in the orbit which was located in the same manner and surgically removed.

In reference to locating foreign bodies the following figures are interesting.

Skiagram 46 was taken from a case sent into hospital with a hurried diagnosis of Diphtheritic Laryngitis. As the patient seemed in danger of being suffocated, tracheotomy was performed. The subsequent condition of the patient not giving the usual symptoms of diphtheritic mischief he was sent to the X-Ray department and a radiogram taken. When this was developed it showed a collar stud to be lodged between the vocal cords. It was then easily removed by the mouth.

Fig. 46.

Of equal interest is the following figure, No: 47. A boy was having teeth extracted under an anaesthetic, when suddenly his breathing became embarrassed. It was suspected that a tooth had slipped into the air passage. He was removed immediately to hospital and as he seemed in great and increasing distress it was deemed advisable to perform tracheotomy without delay. A skiagram was taken immediately afterwards and it showed the position of the tooth. It was removed through the tracheal opening, and the patient made a perfect recovery.

Fig. 47.

Figs. 48 & 49.

Figure 48 is a skiagram taken to locate a coin in the oesophagus, which was removed successfully.

This figure shows a foreign body in a bronchus, which was also successfully removed.

THE THORACIC REGION.

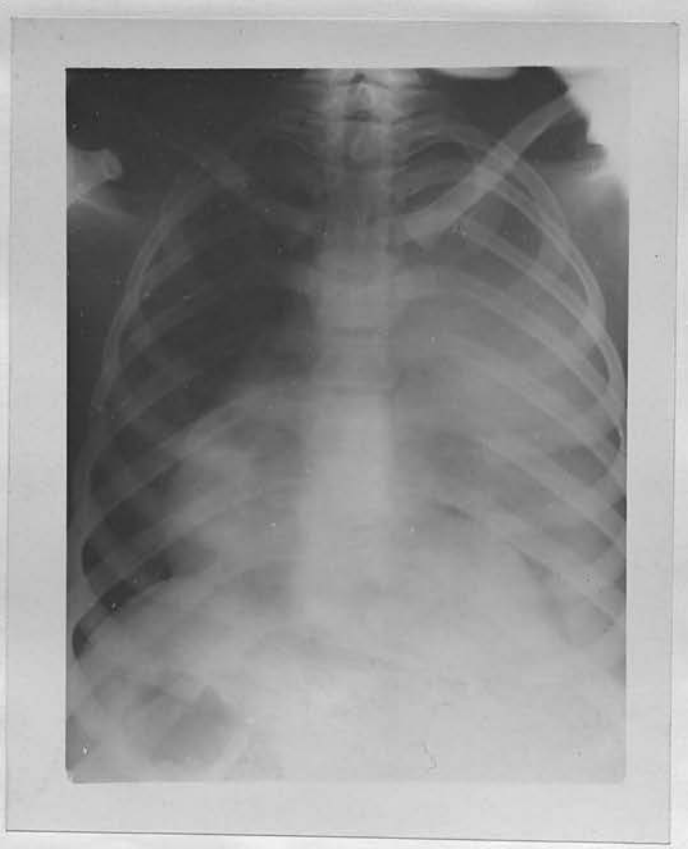
In dealing with the chest greater difficulties have to be overcome in order to get successful skiagrams. Owing to the movements of respiration long exposures are not likely to give skiagrams with good definition. To get the best results a suitable tube with powerful coil is necessary in order that a negative may be got while the patient holds his breath if possible. In diseased conditions of the chest, screen examination is valuable. Although it does not show such minute consolidations as one can discover by exposing plates, yet even in very early tubercular mischief it reveals the affected area and is a convenient method of confirming one's diagnosis. It is a ready means for observing the condition of the aorta and size of the heart. By aid of its modification, the Orthodiagraph, the heart can be accurately measured and exact records kept for future comparison, which is a very helpful method in dealing with cases of dilatation. The same applies to aortic changes. For examining the movement of the diaphragm the screen shows what would be impossible to get in skiagrams. One can note limitations of movement and diminished arching of the diaphragm indicating old or recent chest mischief, besides any interference due to pressure from underneath. This limitation of movement is one of the earliest manifestations of commencing mischief in the lungs, even at the apices.

Whether it is due to reflex nerve influence or to an

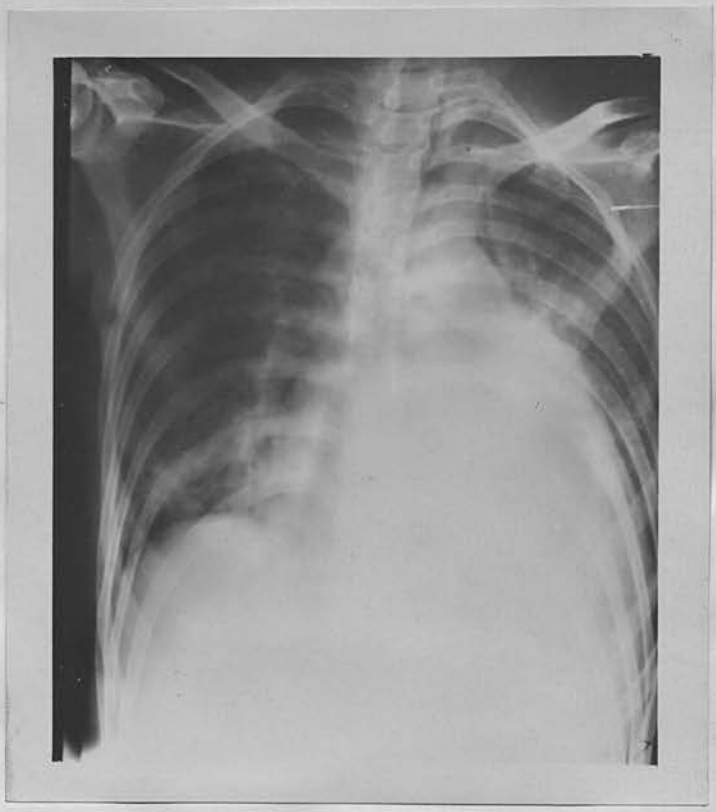
effort to keep the inflamed area at rest is still in doubt. At a later stage the diaphragm may lose some of its arching from having continued overwork. It may be noted here regarding screen examinations that while they may be negative and reveal no abnormality, a positive result may be got from a skiagram as it reveals what can not be detected by the screen.

In demonstrating what can be done by radiography of the chest, it is interesting to see what results can be got from the cadaver. This skiagram (50) is from a patient who had died from pneumonia of the right lung. The shadow given is in marked contrast to the healthy side.

Fig. 50.



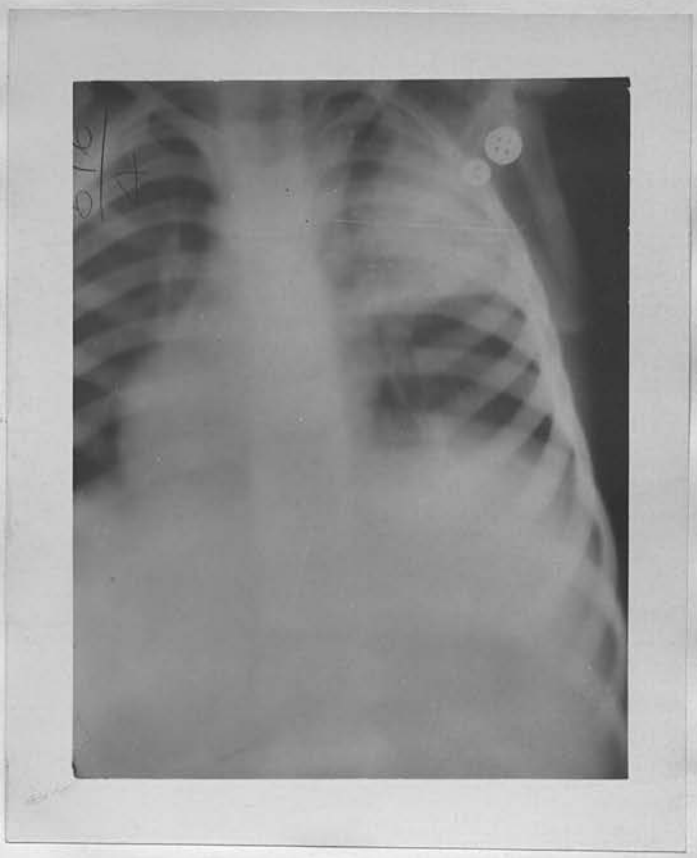
51.



The next figure, 51, is also from the cadaver and gives a much denser shadow owing to the pleura being markedly thickened as well as the lung being consolidated.

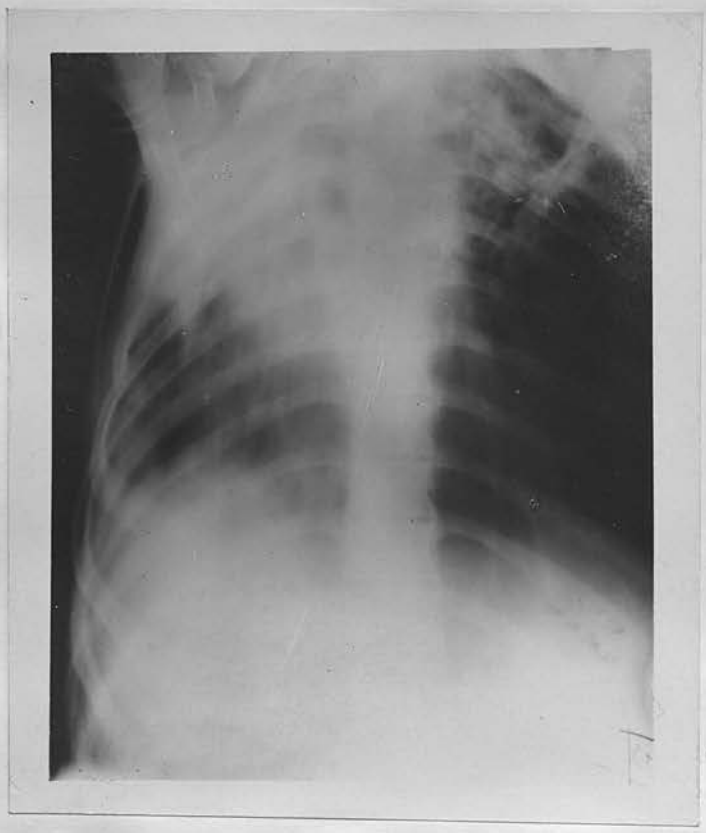
The next illustration 52, shows pneumonia of the middle lobe of the right lung in a child. This child was in hospital and as the physical signs were indefinite while the child's symptoms otherwise indicated pneumonia, it was sent to the X-Ray Department. The skiagram cleared up what doubt there was about the case. The illness ran the usual course, and the patient made a perfect recovery.

52.



53.

54.



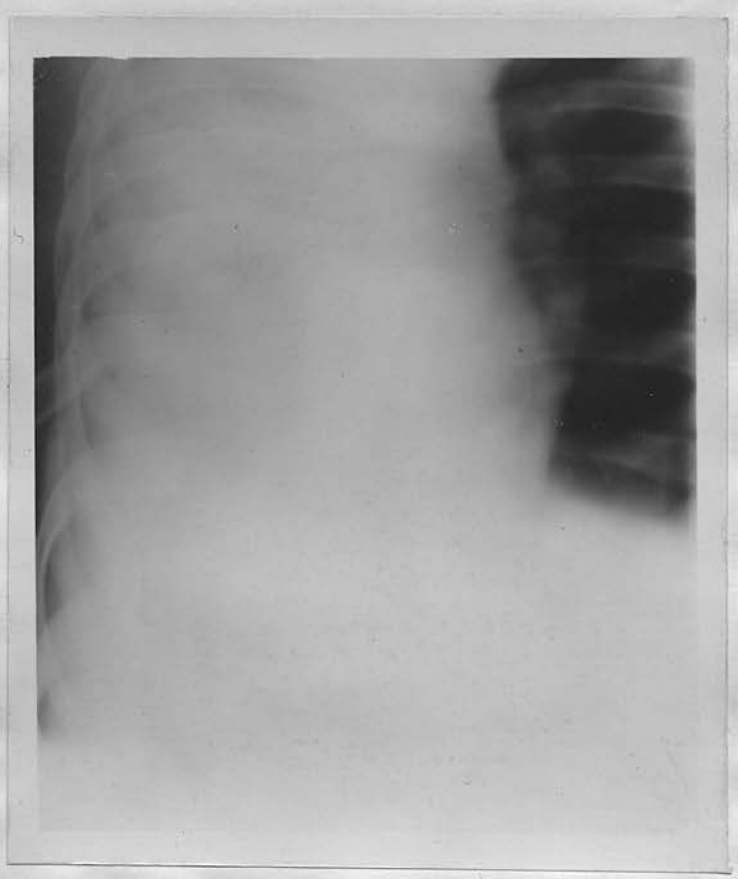
The accompanying skiagrams show two cases of tubercle involving both apices but in different stages, the one apex being much more involved than the other.

The next skiagram is from a patient in the earlier stage of phthisis. The mischief has invaded every part of the right lung, and is commencing in the left. Probably the great area of lung involved accounts to the patient's condition being unsatisfactory. Sanatorium treatment has improved him very little, and even that is not sustained.

Fig. 55.

The following was from a patient in hospital with pneumonia. The whole right lung is involved although not so marked at apex. This skiagram was taken previous to surgical interference in order to help the patient. The operation revealed multiple abscesses of the lung, and the patient died.

Fig. 56.



57.

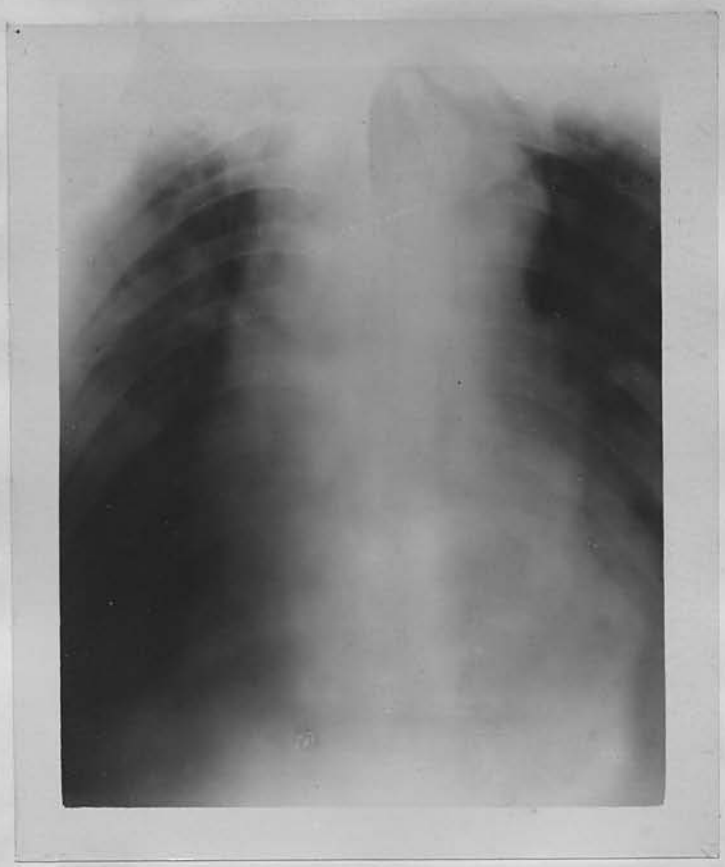
58.

The above two skiagrams are an interesting contrast. They closely resemble one another in appearance while of a very different character. The first is pneumonic consolidation of the outer part of the lower lobe of the right lung while the other and more defined shadow is a sarcomatous cyst originating from the ribs at the same region. The latter is clearly defined and rounded, leaving a noticeable clear area of healthy lung both external and internal to its most dependent part. The former has also, considering its nature, a wonderfully definite outline, but while showing a clear margin of lung internally between it and the heart it has no clear

space externally. This patient made a satisfactory recovery. The other was operated upon but succumbed to haemorrhage. Figs. 59 & 60.

The following two photographs show the intact cyst attached to two ribs and the same after being opened. The contents of the cyst were mainly haemorrhagic while the wall showed sarcomatous elements on microscopic examination.

Fig. 61.



HEART & AORTA.

The above case, 61, indicates the altered appearance revealed by Radiography in a patient with cardio-vascular mischief. The patient had shown evidences of atheromatous changes for years and by the time this radiogram was taken was suffering from dyspnoea and angina pectoris, but the attacks were not severe. The radiogram shows a dilated heart extending beyond the normal to the right as well as to the left. There is a marked aneurismal bulge at the arch of the aorta and the descending aorta gives an abnormal shadow. Though not suffering much and able to get about and attend to

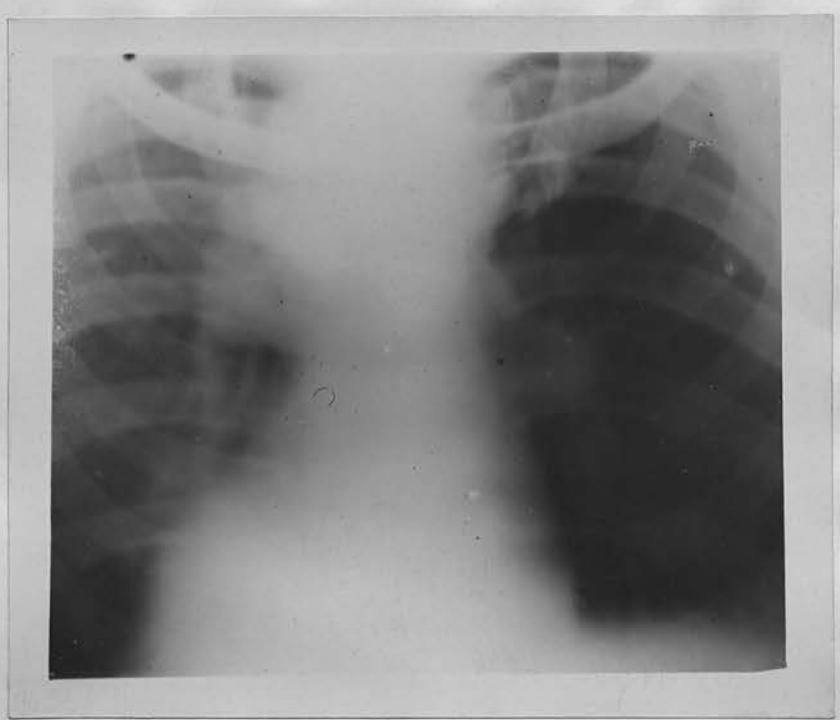
his business in his motor, the patient was advised to rest in bed for some days. As might be feared the patient died suddenly in his bed owing to the rupture of an atheromatous ulcer into the pericardium. At the post-mortem examination the hole made by the ruptured ulcer was large enough to admit the point of the little finger.

The following skiagram is from a case of aortic aneurism in an advanced stage.

Fig. 62.

This is an early stage of aortic disease. The increase in the area of dulness is very slight. The patient suffers from dyspnoea and angina pectoris. The skiagram shows that there is some widening of the arch of the aorta.

Fig. 63.



ALIMENTARY TRACT.

An account of Radiography as a help to medicine and surgery would be incomplete without some reference to the valuable work done by giving patients suffering from diseases of the Stomach and Bowels meals with bismuth and afterwards taking skiagrams at intervals to determine the progress of the bismuth onwards through the stomach and bowels. But it can only be briefly referred to in this paper. Much has been done both in this country and on the Continent in this manner to increase our knowledge of the relative positions of the viscera and their diseases. In this connection screen examinations are fully as interesting as skiagrams. With suitable arrangements for the purpose the progress of the bismuth can be observed as it moves along from the time it leaves the mouth onward.

The following skiagram, fig. 64, although high in the chest, belongs to the alimentary system. The clinical symptoms indicated malignant disease in the oesophagus. The shadow is partly due to the tumour and partly to bismuth. Before being sent to be radiographed the patient was given a bismuth meal and part of it probably intensifies the shadow at the tumour.

Fig. 64.

The following three skiagrams give an indication of the nature of the work done after bismuth meals. The first figure, 65, shows a bismuth meal after getting into the stomach while the shadow under the liver on the other side is a new growth. The second, 66, is from a patient suffering from constipation, where the bismuth is seen all along the colon and descending at the sigmoid flexure. In the third, 67, we have some bismuth in the rectum, while it is also seen at the lower end of the ileum, ileocaecal valve and ascending colon.

Fig. 65.

Fig. 66.

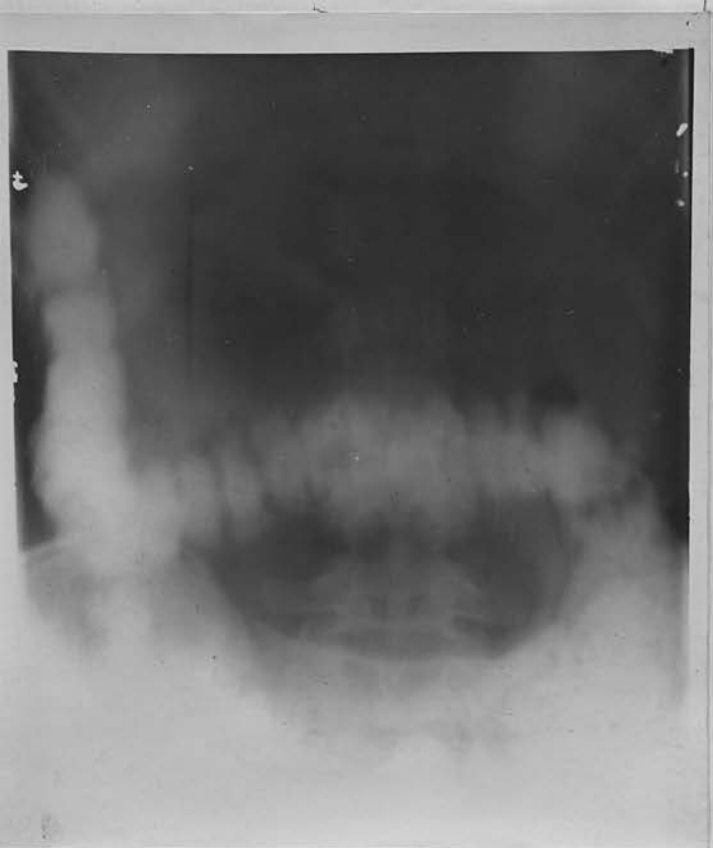


Fig. 67.

The next illustration shows a bismuth meal in the stomach and a large shadow continuous with that of the liver on the other side. The inference from its size was that it was cystic. On operation it was found to be a large hydatid cyst which was surgically dealt with successfully.

Fig. 68.

KIDNEYS & URINARY TRACT.

When we come to the kidneys and urinary tract, we find experience of effects of position and methods of directing the X-Rays through the desired part perhaps more essential and productive of good results than in other regions. Bearing in mind the fact that the nearer the object we wish to examine is to the plate the more certain we are of getting a satisfactory image, various devices have to be tried to attain this object. It must also be borne in mind that the kidney is much affected by respiratory movements which should therefore be controlled. If radiography is being attempted with the patient on his back, plate underneath and tube above, a compresser should be used pressing over the kidney region from the front. This directs the rays to the part aimed at, and restrains the respiratory movements. If the tube be underneath the table or couch on which the patient is lying he should be turned face downward and an air cushion suitably inflated placed underneath his stomach. This checks the diaphragmatic respiratory movements to a great extent, especially if, when the plate is placed in position over the kidney on the back, some form of pressure is also brought to bear on the plate.

The next skiagram shows what can be done in radiography of the kidney when the tube is suitable and working well, and the plate is of the best, and development studied to give the best definition of the required part.

Fig. 69.

This is a beautiful shadow of a normal kidney.

Fig. 70.

Figure 70 shows two stones in the lower pole of the kidney. This was verified by a successful operation for removal of the stones.

The succeeding radiograph shows a stone near the upper pole. This was removed with great difficulty by operation. The patient was a stout subject and the kidney difficult to get at. The surgeon palpated the kidney for a long time and could not detect the stone. He would probably have come to the conclusion that there was no stone if the skiagram had not been there to confirm his diagnosis. He ultimately succeeded in getting the stone which was about the size of a large hazel nut.

Fig. 71.

Fig. 72.

The next three skiagrams show stones of various sizes in the kidney. All these cases were operated upon and the calculi successfully removed.

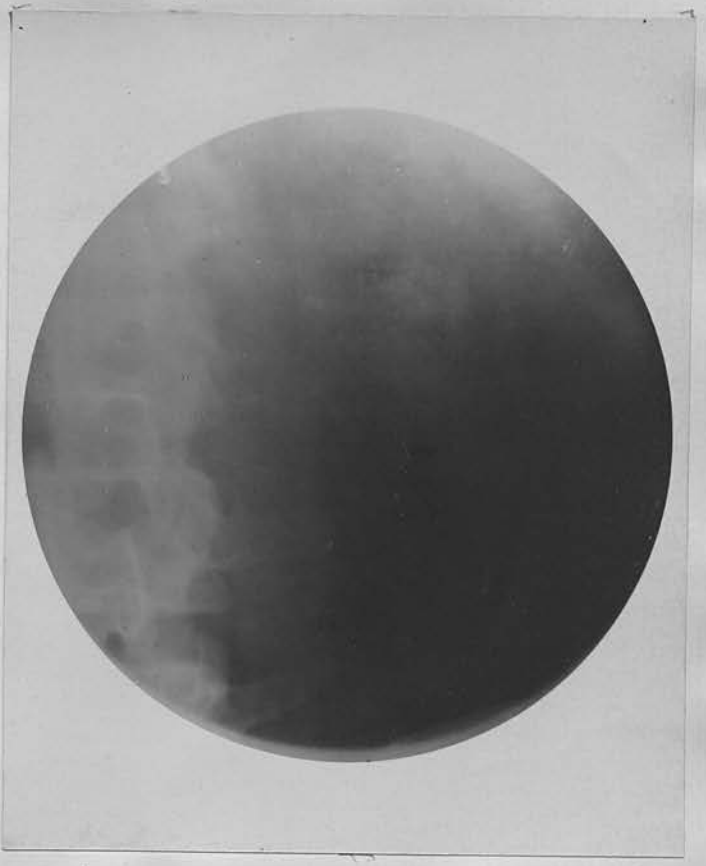
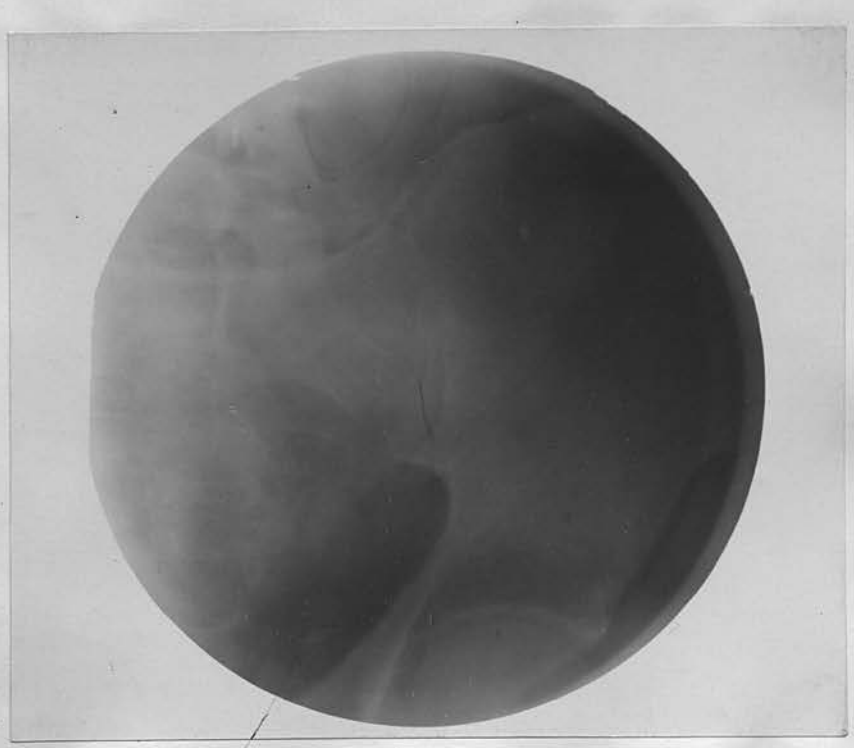


Fig. 73.

Fig. 74.

The next is a very interesting skiagram in view of the history of the case. The first skiagram taken from this patient showed a small shadow in the ureter above the pelvis. His symptoms subsided and did not recur until some months afterwards. When they did recur he came back to be radiographed again. This time the shadow was noticed down in the pelvis. A few days later the shadow seemed to be still lower as seen in the illustration. As the patient was suffering considerably he decided to see a surgeon with a view to having it removed, but before he took this step, his symptoms subsided and he passed the calculus with his urine.

Fig. 75.



The next figure illustrates a case similar to the preceeding. The patient was suffering from violent renal colic. On admission to hospital he was sent down for radiography. A small calculus could be seen in the ureter about the level of the third lumbar vertebra. Repeated skiagrams gave the same result and in view of the smallness of the calculus, operation was deferred in the hope that it would work its way to the bladder. The patient's symptoms soon subsided and he was discharged.

Fig. 76.

The next skiagram was taken from a boy with bladder symptoms. The stone here resembles a coin but with the difference that it shows a clearness in the centre, while a coin would give a shadow of uniform density. The stone was removed by operation, but unfortunately the patient did not recover.

Fig. 77.

The remarkable skiagram of the bladder in the next figure was got from a boy of nine, who has suffered from incontinence of urine all his life. He was radiographed preliminary to exploring the bladder. Under an anaesthetic the bladder was thoroughly examined, and the wall was found uniformly thickened. The sound showed that the wall beside being thickened had lost its smooth surface and was rough inside. The skiagram happened to be taken when the bladder was full. Other skiagrams taken when the bladder was empty gave shadows of different shape but indicating an abnormal condition.

The importance of having the bowels cleared out before taking skiagrams of the various parts of the abdomen may be noted here. It would be impossible to get such a result as the above had the bowel been loaded. This is an essential preliminary to taking skiagrams for calculi in all regions.

Fig. 78.

The following two skiagrams are very interesting, and show on each side of the spine strings of calcifying caseous glands.

Fig. 79.

Fig. 80.

The next skiagram is one taken to ascertain the condition of the spine of a patient with old-standing curvature. The operator was very successful in getting such a good picture, and careful examination of it does not reveal any sign of active mischief. The patient was not suffering from any discomfort, but wished to get reassured on his condition.

Fig. 81.

The next skiagram is another to illustrate past mischief in the spine. Here the third, fourth, and fifth lumbar as well as the upper sacral vertebrae have suffered but are now free from mischief as is indicated by their clearly defined outlines.

Fig. 82.

This series of skiagrams demonstrates that in Radiography we have a valuable means of confirming and verifying clinical conclusions. In cases of injuries to bones and joints doubtful points can be cleared up and treatment put on a surer basis. But in all instances it is important that cases should be first thoroughly examined in the older and well established methods. After doing so, if any doubt remains, then is the time to have a skiagram taken. It is impossible to have appliances at hand for radiography except in a limited number of cases, and even then the skiagram may give very little enlightenment without thorough previous examination. In the illustrations given in this paper on fractures, only skiagrams are shown of cases presenting marked difficulty in precise diagnosis. The injury shown in figure 1, although in a most accessible part, owing to the absence of the usual symptoms of fracture, was not detected. The exact nature of the mischief in Fig. 3, it was not possible to detect by touch alone. The illustrations given of injuries at or near the shoulder joint in Figs. 8, 9 & 10 give valuable aid to physical examination and treatment. The cases shown in Figs. 14, 17 & 23, may also be emphasised. In conditions of disease clinical conclusions are much aided by the evidence given in Figs. 32, 33 & 40 .

In considering radiography of the cranial cavity we have convincing proof of the necessity of clinical experience prededing X-Ray examination. The region of the

tumour shown in Fig. 43, was first located by the clinician and then confirmed by the skiagram. Without the history of the case the skiagram would be valueless.

Even when foreign bodies, in whatever part, have to be dealt with, careful examination of the symptoms must first be accomplished, and as a rule that will indicate the spot to be radiographed for confirmation.

The experienced clinician can tell the condition of the lungs in cases of disease with an accuracy that leaves little or nothing that can be detected by Radiography, but in case of doubt he is sure to get assistance from it. In the case illustrated in Fig. 58, such assistance was very valuable. The size and extent to which the tumour invaded the lung substance was clearly shown. The same may be said of screen examinations of the range of movement of the diaphragm and its proved significance, when diminished, bith in cases of commencing and advanced disease of the lung.

In disease of the heart and aorta it aided to confirm the diagnosis arrived at from the clinical examination and history in the cases illustrated in Figs. 61 and 63.

The future has still to show what can be done by aid of Radiography to assist the clinician in dealing with disease of the intestinal tract. Even now it has altered opinions held as to the positions, more especially of the stomach and colon, both in health and disease. This, as has been mentioned in connection with the figures showing

bismuth in the stomach and bowels can be studied both from skiagrams and screen examination. Diagramatic sketches should be taken at intervals as a record of what is seen on the screen. Figs. 65 and 68 show that new growths can be demonstrated. In attempting to do this the importance of previously clearing out the bowel, to prevent confusing with shadows from faecal matter must not be overlooked. The same precaution is necessary for careful clinical examination which here also can detect what the radiogram may confirm.

In no region has Radiography proved more helpful than in dealing with the urinary system. When careful clinical study of a case indicates the likelihood of a calculus, a skiagram should be taken and the surgeon now has this invariably done before attempting operation. After getting such a history the Radiographer must not be satisfied if his negative does not show a calculus. He must take repeated skiagrams of the kidney, ureter and bladder before he is satisfied, and he will probably succeed in showing that the clinical diagnosis was correct. The cases of calculi which have been shown in this paper are all extremely interesting, helpful and instructive, but especially so Figs. 75 and 76 showing small calculi in the ureters. It is very interesting to note one of these in situ and a few days after to be told that the symptoms have subsided and that the calculus has passed through the urethra.

Mention has been ommitted so far in this paper of a method of Radiography that is very helpful; that is, having negatives taken to be used stereoscopically. It helps to show the relative position of parts, making them stand out in relief, and is of assistance in dealing with fractures, foreign bodies and calculi.

While claiming so much for radiography one finds its results very valueless without full clinical knowledge of the case under consideration. Even operators of great experience such as Dr Thurston Holland of Liverpool and Dr Knox of London would not readily commit themselves to give an opinion of a skiagram without hearing the clinical points of the case. For the full interpretation of negatives one requires large experience in examining them, as the untrained eye readily misses important points. We have in this branch added another specialist to our list and we should be dependent on his training and experience for guidance. It is impossible to have satisfactory Radiography unless the operator has full knowledge of anatomy, surgery and medicine. He must have wide clinical experience. He must know how to vary the time of exposure of his plates according as his tube is working. He must know how to develop his negatives. When he knows that he can judge how to expose and develop his plates for the object desired. If he makes a mistake on any of these points he is sure to have lack of the necessary definition and detail;when the skiagram is satisfactorily finished he

must interpret it. To be able to do this he must be familiar with the chief points in negatives and their clinical significance.

Radiography has not come to displace the older clinical methods of examining patients. All our well established methods of diagnosis are still as essential as in the past and must be diligently cultivated while Radiography may be confidently looked to for further light and confirmation.

In attempting to cover practically the whole field of Radiography, this Thesis, in its treatment of individual regions, has been necessarily brief. Any single region of the body would provide more than sufficient material for an exhaustive and lengthy thesis. The object I have aimed at is rather to illustrate its application to all the regions of the body and make an interesting and instructive selection from material that extends to many hundreds of negatives which have come within my knowledge during more than two years' participation in such work.

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LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS

(Continued)

49. Foreign body in a bronchus.
50. Pneumonic lung from the cadaver.
51. " " with thickened pleura from the cadaver.
52. Pneumonia of middle lobe of right lung.
53. Early phthisis involving both apices.
54. Phthisis of both apices more advanced.
55. Early phthisis involving whole lung.
56. Pneumonia with multiple abscesses.
57. " of lower lobe of right lung.
58. Sarcomatous cyst at base of right lung.
59. " " photographed.
60. " " , photograph of section.
61. Aneurism of aorta and dilated heart.
62. " " " " " "
63. Dilated aorta and heart.
64. Tumour of oesophagus.
65. Bismuth in stomach and new growth.
66. " " the colon.
67. " " " rectum.
68. " " " stomach and hydatid cyst.
69. Normal kidney.
70. Renal calculi.
71. " calculus.
72. " calculi.
73. " "
74. " "
75. Calculus in the ureter.
76. " " " "
77. " " " bladder.
78. Bladder with thickened wall.
79. Calcifying caseous glands.
80. " " "
81. Curvature of the spine.
82. Ankylosed lumbar vertebrae.

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